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EXAMINER	
LEE, CHEUNG	

ART UNIT	PAPER NUMBER
2812	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,418	HONGO, HIROO	
	Examiner	Art Unit	
	CHEUNG LEE	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 August 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) *9-19* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8 and 20-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 February 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *2-1-05, 3-3-05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Group I, claims 1-8 and 20-34, in the reply filed on August 8, 2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Information Disclosure Statement

2. The information disclosure statements (IDS) submitted on 2/1/05 and 3/3/05 were filed before the first action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statements are considered by the examiner.

Claim Objections

3. Claims 20 and 29 are objected to because of the following informalities:

- In claim 20, line 19, substitute "a" with --the-- before "catalyst supporting substrate".
- In claim 29, line 3, substitute "are" with --is-- before "patterned".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 3-4 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Lee et al. (EP 1061043 A1; hereinafter "Lee").

5. Referring to figures 1-7C and related text, Lee discloses [Re claim 1] a catalyst supporting substrate comprising: a first region 120 which is formed on a substrate 110 (col. 4, paragraph 14; see fig. 2A); and second region 130P (region where catalysts are formed) which is formed covering a part of said first region (see fig. 3); wherein said first region includes a catalyst supporting portion 120 containing a first material (col. 4, paragraph 14; see fig. 3), said second region includes a catalyst portion 130P containing a second material which is different from said first material (col. 4, paragraph 13), said first material includes a metal containing at least one of elements selected from the second group to the fourteenth group of the periodic table or a compound thereof (alumina, col. 4, paragraph 14), and said second material is a catalyst 130P which grows carbon nanotubes 150 in a vapor phase (col. 6, paragraph 24).

6. Lee discloses [Re claim 3] wherein said second material includes a metal containing at least one of elements selected from a group consisting of Fe, Ni, Co, Ru, Rh, Pd, Os, Ir, Pt, La, Y, Mo, and Mn or a compound thereof (col. 4, paragraph 13).

7. Lee discloses [Re claim 4] wherein said first material includes a metal containing at least one of elements selected from a group consisting of Al, Mo, Ti, Ta, Cr, Cu, Mn, Mg, Zr, Hf, W, Ru, Rh, Zn and Sn or a compound thereof (alumina, col. 4, paragraph 14).

8. Referring to figures 1-7C and related text, Lee discloses [Re claim 20] a method for growing carbon nanotubes comprising: (a) providing a catalyst supporting substrate (see fig. 2A), wherein said catalyst supporting substrate including: a first region 120 which is formed on a substrate 110 (col. 4, paragraph 14; see fig. 2A); and second region 130P (region where catalysts are formed) which is formed covering a part of said first region (see fig. 3); wherein said first region includes a catalyst supporting portion 120 containing a first material (col. 4, paragraph 14; see fig. 3), said second region includes a catalyst portion 130P containing a second material which is different from said first material (col. 4, paragraph 13), said first material includes a metal containing at least one of elements selected from the second group to the fourteenth group of the periodic table or a compound thereof (alumina, col. 4, paragraph 14), and said second material is a catalyst 130P which grows carbon nanotubes 150 in a vapor phase (col. 6, paragraph 24); and (b) growing said carbon nanotubes by supplying raw material gas containing carbon to the catalyst supporting substrate (col. 6, paragraph 24; step 40 in fig. 1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 2, 5-8 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee as applied to claim 1 above, and further in view of Coll et al. (US Pub. 2003/0042226; hereinafter "Coll")..

10. [Re claim 2] Lee fails to disclose expressly wherein said carbon nanotubes include single-wall carbon nanotubes.

Referring to figures 1-4 and related text, Coll disclose single wall nanotubes (page 4, paragraph 30; see claim 29).

Also, Lee discloses wherein carbon nanotubes have a diameter from 1 nm to a few hundred nanometers. Single-wall nanotubes have a diameter of close to 1 nm. This means Lee also may produce single-wall nanotubes.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to produce single-wall nanotubes, as taught by Coll, because it would have been to miniaturize electronic beyond the micro electromechanical scale, and to obtain fewer defects than multi-wall nanotubes' and therefore having stronger and more conductive than multi-wall nanotubes.

11. Lee discloses [Re claim 5] wherein said first region includes a metal film 120 which contains said first material (col. 4, paragraph 14) and is formed on said substrate (see fig. 2A), but Lee fails to disclose expressly wherein said catalyst supporting portion includes a film that an upper portion of said metal film is oxidized or hydroxylated.

Referring to figures 1-4 and related text, Coll disclose wherein a structural metallic element 18 is oxidized to form a nano-supported sponge catalyst 10 (page 2, paragraph 19).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to oxidize a metal film, as taught by Coll, because it would have been to obtain active catalytic metallic element nano-particles that are about one-tenth of a nanometer (0.1 nm) and therefore miniaturizing electronic beyond the micro electromechanical scale.

12. Lee discloses [Re claim 6] wherein said second material includes a metal containing at least one of elements selected from a group consisting of Fe, Ni, Co, Ru, Rh, Pd, Os, Ir, Pt, La, Y, Mo, and Mn or a compound thereof (col. 4, paragraph 13).

13. Lee discloses [Re claim 7] wherein said first material includes a metal containing at least one of elements selected from a group consisting of Al, Mo, Ti, Ta, Cr, Cu, Mn, Mg, Zr, Hf, W, Ru, Rh, Zn and Sn or a compound thereof (alumina, col. 4, paragraph 14).

14. Lee discloses [Re claim 8] wherein a surface of said catalyst supporting portion includes at least one selected from aluminum natural oxide film, boehmite, α alumina, γ alumina, δ alumina, and θ alumina (alumina, col. 4, paragraph 14).

15. [Re claim 21] Lee fails to disclose expressly wherein said carbon nanotubes include single-wall carbon nanotubes.

Referring to figures 1-4 and related text, Coll disclose single wall nanotubes (page 4, paragraph 30; see claim 29).

Also, Lee discloses wherein carbon nanotubes have a diameter from 1 nm to a few hundred nanometers. Single-wall nanotubes have a diameter of close to 1 nm. This means Lee also may produce single-wall nanotubes.

The motivation statement stated in claim 2 also applies.

16. Claims 22-23, 25-29 and 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee as applied to claim 20 above, and further in view of Brandes et al. (US Pat. 6445006; hereinafter "Brandes").

17. [Re claims 22 and 23] Lee fails to disclose expressly [Re claim 22] wherein said step (b) includes: (b1) growing said carbon nanotubes in the direction along a surface of said catalyst supporting substrate; and [Re claim 23] wherein said step (b1) includes: (b11) applying an electric field with the predetermined direction to said catalyst supporting substrate.

Referring to figures 1A-10 and related text, Brandes discloses wherein carbon nanotubes (237, 703) are growing in the direction along a surface of a substrate (231, 700) (see figs 4A-4D and 10) using an electric field-generating circuit comprising power source 118 and line 121 (col. 5, lines 42-52).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use an electric field to grow carbon nanotubes in a desired direction, as taught by Brandes, because it would have been to form a wiring system comprising carbon nanotubes connectors in a microelectronic or microelectromechanical device structure (Brandes, col. 2, lines 14-17).

18. [Re claim 25] Lee fails to disclose expressly wherein said step (a) includes: (a1) forming said first region and said second region which predetermined shape on said substrate.

Referring to figures 1A-10 and related text, Brandes discloses wherein a catalyst support layer 14 and a catalyst layer 15 are patterned (col. 4, lines 39-42; see fig. 1A).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to pattern a catalyst support layer and a catalyst layer, as taught by Brandes, because it would have been to form carbon nanotubes in a specific area of a substrate where only patterned catalyst support layer and patterned catalyst layer are present.

19. [Re claim 26] Lee fails to disclose expressly wherein said carbon nanotubes include single-wall carbon nanotubes.

Referring to figures 1A-10 and related text, Brandes disclose single wall nanotubes (col. 2, lines 30-40).

Also, Lee discloses wherein carbon nanotubes have a diameter from 1 nm to a few hundred nanometers. Single-wall nanotubes have a diameter of close to 1 nm. This means Lee also may produce single-wall nanotubes.

The motivation statement stated in claim 2 also applies.

20. Lee discloses [Re claim 27] wherein said second material includes a metal containing at least one of elements selected from a group consisting of Fe, Ni, Co, Ru, Rh, Pd, Os, Ir, Pt, La, Y, Mo, and Mn or a compound thereof (col. 4, paragraph 13).

21. Lee discloses [Re claim 28] wherein said first material includes a metal containing at least one of elements selected from a group consisting of Al, Mo, Ti, Ta, Cr, Cu, Mn, Mg, Zr, Hf, W, Ru, Rh, Zn and Sn or a compound thereof (alumina, col. 4, paragraph 14).

22. [Re claim 29] Lee fails to disclose expressly wherein said step (a1) includes: (a11) forming a catalyst supporting portion which is patterned with predetermined shape on said substrate, and (a12) forming a catalyst portion which covers a part of a surface of said catalyst supporting portion.

Referring to figures 1A-10 and related text, Brandes discloses wherein a catalyst support layer 14 and a catalyst layer 15 are patterned, and the catalyst layer covers top surface of the catalyst support layer (col. 4, lines 39-42; see fig. 1A).

The motivation statement stated in claim 25 also applies.

23. Lee discloses [Re claim 31] wherein said step (a12) includes: (a121) forming said catalyst portion by any one of methods of a deposition method, a sputtering method and a CVD method (col. 4, paragraph 13).

24. [Re claim 32] Lee fails to disclose expressly wherein said step (b) includes: (b3) growing said carbon nanotubes in the direction along a surface of said catalyst

supporting substrate by applying an electric field with the predetermined direction to said catalyst supporting substrate.

Referring to figures 1A-10 and related text, Brandes discloses wherein carbon nanotubes (237, 703) are growing in the direction along a surface of a substrate (231, 700) (see figs 4A-4D and 10) using an electric field-generating circuit comprising power source 118 and line 121 (col. 5, lines 42-52).

The motivation statement stated in claims 22 and 23 also applies.

25. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee as applied to claim 20 above, and further in view of Resasco et al. (US Pub. 2005/0042162; hereinafter "Resasco").

26. [Re claim 24] Lee fails to disclose expressly wherein said step (b) includes: (b2) bringing reducing gas into contact with a surface of said catalyst supporting substrate.

Referring to figure 1 and related text, Resasco discloses wherein catalytic particles are exposed to a reducing gas (page 2, paragraph 26; see step C in fig. 1).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use reducing gas before forming carbon nanotubes, as taught by Resasco, because it would have been to reduce catalyst within catalytic particles to prepare it for catalysis, thereby controlling the quantity and form of carbon nanotubes produced (Resasco, page 1, paragraph 11; page 2, paragraph 25).

27. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Brandes as applied to claim 29 above, and further in view of Coll.

28. Lee discloses [Re claim 30] wherein said step (a11) includes: (a111) forming a metal film which contains 120 which contains at least one of elements selected from the second group to the fourteenth group of the periodic table (col. 4, paragraph 14), but Lee fails to disclose expressly wherein (a112) forming said catalyst supporting portion by oxidizing or hydroxylating an upper portion of said metal film.

Referring to figures 1-4 and related text, Coll disclose wherein a structural metallic element 18 is oxidized to form a nano-supported sponge catalyst 10 (page 2, paragraph 19).

The motivation statement stated in claim 5 also applies.

29. Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Brandes as applied to claim 25 above, and further in view Resasco.

30. [Re claim 33] Lee in view of Brandes fails to disclose expressly wherein said step (b) includes: (b4) bringing reducing gas into contact with a surface of said catalyst supporting substrate.

Referring to figure 1 and related text, Resasco discloses wherein catalytic particles are exposed to a reducing gas (page 2, paragraph 26; see step C in fig. 1).

The motivation statement stated in claim 24 also applies.

31. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee in view of Brandes.

32. Lee discloses [Re claim 34] substantially the claimed limitations, as shown in claim 1, but Lee fails to disclose expressly wherein (c) forming a catalyst containing film, which is patterned with predetermined shape; (d) growing said carbon nanotubes in the direction along a surface of said semiconductor substrate; (e) forming a first electrode which is connected to a part of said catalyst containing film side of said carbon nanotubes and a second electrode which is connected to a part of another side of said carbon nanotubes; and (f) forming a gate electrode which applies a voltage to said carbon nanotubes between said first electrode and said second electrode.

Referring to figures 1A-10 and related text, Brandes discloses wherein a catalyst support layer 14 and a catalyst layer 15 are patterned (col. 4, lines 39-42; see fig. 1A).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to pattern a catalyst support layer and a catalyst layer, as taught by Brandes, because it would have been to form carbon nanotubes in a specific area of a substrate where only patterned catalyst support layer and patterned catalyst layer are present.

Referring to figures 1A-10 and related text, Brandes discloses wherein carbon nanotubes (237, 703) are growing in the direction along a surface of a substrate (231, 700) (see figs 4A-4D and 10).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to use an electric field to grow carbon nanotubes in a desired direction, as

taught by Brandes, because it would have been to form a wiring system comprising carbon nanotubes connectors in a microelectronic or microelectromechanical device structure (Brandes, col. 2, lines 14-17).

Referring to figure 10 and related text, Brandes discloses wherein a carbon nanotube 703 is connected between source electrode 702 and drain electrode 704, and a gate electrode 705 is formed on a substrate 700 and it is located between source and drain electrodes (col. 8, lines 48-60; see fig. 10). A potential can be applied on the gate electrode to modulate the conductivity of the carbon nanotube (col. 8, lines 48-60).

At the time of the invention it would have been obvious to a person of ordinary skill in the art to form a gate electrode, source and drain electrodes, and a carbon nanotube connecting source and drain electrodes, as taught by Brandes, because it would have been to form a carbon nanotube field effect transistor (Brandes, col. 8, lines 59-60).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHEUNG LEE whose telephone number is 571-272-5977. The examiner can normally be reached on Monday through Friday from 9:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Garber can be reached on 571-272-2194. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Walter L. Lindsay, Jr./
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October 25, 2008